# Understanding mobility inequality

Hidayati, Isti

*DOI:*
10.33612/diss.146785021

[This page is intentionally left blank]

# 8 Conclusions

## 8.1. Research findings

This dissertation aims to provide **socio-spatial insights into mobility inequality**, which is manifested as the marginalisation of pedestrians and the neglect of the mobility needs of socially marginalised groups. To unpack how socio-spatial contexts influence the embodiment of mobility inequality in Southeast Asian metropolitan cities (i.e. Jakarta and Kuala Lumpur), this dissertation employed a mixed method combining spatial analysis, visual analysis, analysis of interviews and on-street surveys, literature review, and statistics. This method was proven applicable in the context of fast-growing metropolitan cities where official detailed data are limited, especially regarding the marginalised groups. Through primary data collection of mobility experiences in the informal settlements using on-street surveys, in-depth interviews with experts and citizens, and recordings of mobility conditions using walking with video approach, complemented by spatial configurational analysis performed at the metropolitan and neighbourhood scale and reviews of publications and policies, this dissertation revealed the socio-spatial interplay and mechanisms producing mobility inequalities in Jakarta and Kuala Lumpur. To understand how the socio-spatial interplay generates mobility inequality, the research question was formulated as:

> (1) *How can mobility inequality be understood given the socio-spatial contexts of Southeast Asian metropolitan cities (i.e. Jakarta and Kuala Lumpur)?*
>
> (2) *To what extent does the socio-spatial contexts influence the emergence and manifestation of mobility inequality, in relation to transport and land use, across scales (i.e. metropolitan and neighbourhood scale)?*

The research question was operationalised into three research sub-questions (SQs):

Sub-research question (SQ) 1:

*How is mobility inequality defined across various fields and how does these understandings enable the identification of challenges for addressing mobility inequality?*

Sub-research question (SQ) 2:

*How does mobility inequality evolve through time in transport and land use policies as manifested in urban spatial configurations at the metropolitan scale in Jakarta and Kuala Lumpur?*

Sub-research question (SQ) 3:

*How is mobility inequality manifested in relation to individual attributes, transport and land use, and social-cultural constructs at the neighbourhood scale in Jakarta and Kuala Lumpur?*

From the findings presented in Sections 2 to 5**, mobility inequality in the context of Southeast Asian metropolitan cities can be understood as disproportionate difficulties and inconveniences experienced by the marginalised, especially the captive pedestrians and women, in the context of daily travel activities in order to access key functions** (e.g. school, work). This contextual understanding improved the pre-defined conceptual model, whereby mobility inequality was generally understood as differences in the ability and capacity to move (Figure 8.1). In Jakarta and Kuala Lumpur, mobility difficulties and inconveniences are manifested (sometimes subtle) in the feeling unsafe while walking, especially for women, and the inability to realise potential pedestrian accessibility. It should be noted that in both cities, walking functions as the first and last mile connection to other modes (i.e. public transport, pick up point of ridesourcing services). In the low income settlements in Jakarta, walking also serves as part of social interaction.

The understanding of mobility inequality is explored by answering the sub-research question 1 regarding conceptualisation of mobility inequality as differences in mobility, in terms of physical transport movement and related to social and spatial practices in accessing key functions (see Section 2). Contributing to these differences are intrinsic factors (i.e. individual attributes) and extrinsic factors (i.e. spatial and socio-cultural constructs). Challenges for understanding mobility inequality are identified as practical, conceptual, and socio-cultural challenges. For Southeast Asia context, the practical challenges lie on the limited data availability, hence, a mixed method combining qualitative and quantitative methods and multiple datasets is proposed for defining and measuring mobility inequality. Socio-cultural challenges are explored in Section 3 and 4 regarding socio-cultural stereotypes attached to walking and driving (Hidayati et al., 2019; 2020a; 2020b), while conceptual and practical challenges are identified in Section 5 regarding the policy insights for understanding and addressing mobility inequality.

**The extent of mobility difficulties and inconveniences is amplified by the socio-spatial contexts at both metropolitan and neighbourhood scales, and occur at the system and individual levels**. The socio-spatial contexts exacerbating mobility inequalities include the socio-cultural stereotypes associating walking with low income individuals and as an unsafe means of transport, the transport and land use system that prioritises private motorised vehicles while neglects public transport and walking, and spatial configurations that form a well-integrated vehicular network facilitating use of cars over other modes. Highly integrated pedestrian networks in low income settlements cannot be actualised due to socio-cultural stereotypes and the lack of walking infrastructure.

At the metropolitan scale (sub-research question 2), the socio-spatial contexts appear more at the system level as transport and land use policies over time shape the street networks and form societal values regarding private motorised vehicle dependency as evidenced through spatial analysis and in-depth interviews. This relation indicates path dependencies which are difficult to reverse (Figure 8.1). The emergence of mobility inequalities started in Jakarta through the nationalisation policies and through the 'world class city' vision in Kuala Lumpur, whereby both blindly adopted a development path of road expansion copying North American transport planning practices (see Section 3). These policies are reflected in the spatial configuration whereby highly integrated streets are centred on highways instead of the historic core, which is more pedestrian friendly. Over time, planning policies embedded the organisational routine of prioritising motorised traffic and discouraging walking and the use of public transport. Society translates this routine into high dependency on cars and motorcycles, which nullify the walkability potential in both cities. The impacts of previous planning policies are difficult to reverse and take a long-time to be fixed as they span across spatial scales and generations.

At the neighbourhood scale (sub-research question 3), the individual attributes play a more significant role in producing mobility inequalities (Figure 8.1). The choice of frequently used transport mode, as a proxy of income, influences perceptions of safety as evidenced from the on-street surveys with those who walk attaching more negative feelings to their mobility experience as compared to those who drive. In terms of gender,

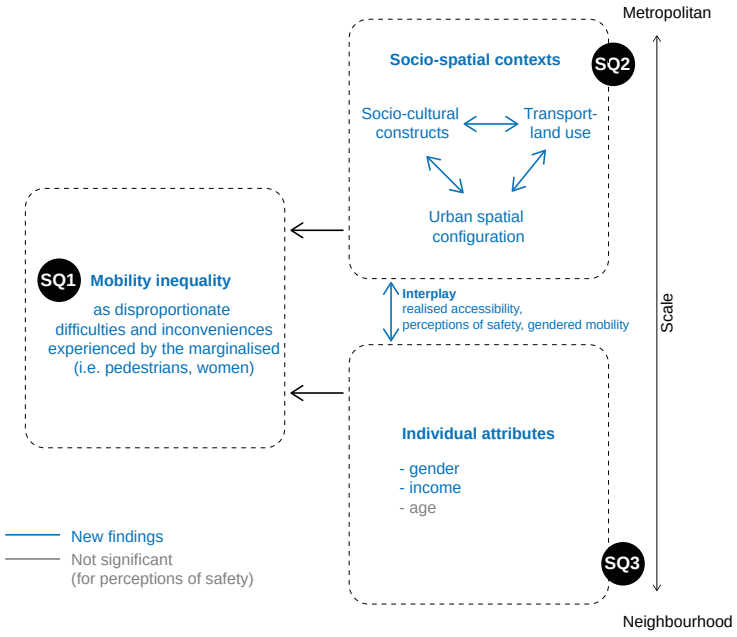


Figure 8.1. Improved conceptual model

women indicate stronger negative attachment while walking compared to men. This relation is less significant in Jakarta but more prominent in Kuala Lumpur. Age, however, did not indicate a significant effect for mobility inequality in both Jakarta and Kuala Lumpur. Furthermore, although mobility difficulties are individually differentiated, they are also influenced by the local socio-spatial contexts. This is evidenced in Section 4 that the negative perceptions of walking are induced by social stereotypes, coarse urban grain, and non-active land use, which inhibits the realisation of potential pedestrian accessibility in the low income settlements. Moreover, Section 4 also revealed the influence of local socio-spatial contexts regarding differences in the perceptions of safety in Jakarta and Kuala Lumpur. Perceptions of safety in Jakarta were more about the wariness of faster vehicular movement (i.e. motorcycles vs. walking), whereas in Kuala Lumpur, they were more concerned about the lack of other pedestrians, especially for women, indicating a gendered mobility. This relates to the local contexts whereby in Jakarta, walking still presents a form of social interaction and streets with potential route choices (i.e. will be traversed by more people) were considered as safe and associated with positive experiences by the respondents. Conversely, in Kuala Lumpur, where walking is detached from social interaction and mostly serves as a means to move from origin to destination, streets with potential route choices have less impact on mobility experiences unless there are pedestrian attractors (e.g. street food hawker). This is confirmed by the spatial analysis using space syntax and a statistical correlation analysis between the space syntax results and the perceptions of safety from the on-street surveys. In sum, the interplay of individual attributes and socio-spatial contexts generate mobility inequalities through realised accessibility (Section 4, Chapter 5), perceptions of safety, and gendered mobility (Section 4, Chapter 6).

The research findings above enable a construction of an improved conceptual model (Figure 8.1), enriched with an in-depth understanding of socio-spatial contexts and individual attributes generating mobility inequalities in Southeast Asian metropolitan cities (i.e. Jakarta and Kuala Lumpur).

Summary of key findings from Section 2 to 4 are described in Table 8.1.

## 8.2. Contributions to theory

This dissertation contributes in providing a critical reflection on mobility inequality by (1) combining two major strands of mobility studies, thus incorporating both technical-functional perspective from transport mobility and in-depth descriptive reasoning from practice mobility (2) combining spatial and social theories for understanding mobility, and (3) theory validation by presenting empirical evidence of mobility inequalities in Jakarta and Kuala Lumpur, thus enriching mobility studies that are dominated by cases from the regions of developed economies. The first two contributions refer to the knowledge gap in understanding the socio-spatial interplay producing mobility inequalities, while the third contribution aims to fill the practical gap towards implementation.

### *8.2.1. Contribution to academic debate on mobility*

Focusing on the socio-spatial interplay, this dissertation incorporated perspectives from both transport and practice mobility. Differences in mobility were analysed by looking at how individual differences (i.e. gender, income) influence the production of mobility as social and spatial practices related to daily travel activities. Results from the spatial analysis were linked to the understanding of the socio-cultural contexts (i.e. stereotypes on walking and driving), capturing the underlying reasonings behind differences in mobility. This process links back to the

Table 8.1. Key findings regarding mobility inequality in Southeast Asian metropolitan cities

| Sections of the thesis | Topic/ Keyword | Method | Findings |
|---|---|---|---|
| Section 2: Conceptualisation of mobility inequality | Conceptualising mobility inequality (Chapter 2) | Literature review | • Mobility inequality discussion encompasses the understanding of causes and impacts of differences in mobility, in terms of physical transport movement and as related to spatial and social practices in accessing key functions.<br>• Contributing factors of mobility inequality include intrinsic factors (i.e. individual attributes) and extrinsic factors (i.e. spatial and socio-cultural constructs). The interplay of these factors can improve or restrain mobility of certain socio-economic groups.<br>• Approaches to understand mobility inequality ranging from quantitative, qualitative, or mixed method, and drawing from large-scale, small-scale, or multiple datasets.<br>• Dilemmas and challenges for understanding and addressing mobility inequality involve practical, conceptual, and socio-cultural aspects.<br>• Planning practice should start to consider the mobility needs of the socially marginalised group in the planning process. |
| Section 3: Mobility inequality at the metropolitan scale | The emergence of mobility inequality in Jakarta (Chapter 3) | Mixed method combining:<br>• Review of transport and land use policies<br>• Space syntax<br>• Visual analysis of video recordings | • Previous transport and land use policies influence mobility inequality in Jakarta indicating a path dependency<br>• Transport and land use policies are manifested in spatial structure, which affect current mobility behaviour<br>• Pedestrian networks in Jakarta formed a discontinuous and unstructured pattern over time compared to well-connected vehicular networks<br>• Car-oriented development in Jakarta marginalised those without access to private vehicle<br>• Mixed method provides visual depiction on the emergence of mobility inequality in Jakarta |
| | The emergence of mobility inequality in Kuala Lumpur (Chapter 4) | Mixed method combining:<br>• Review of transport and land use policies<br>• Space syntax<br>• Analysis of in-depth interviews | • Previous transport and land use policies have shaped street network configuration and mobility behaviour through socio-spatial dynamics<br>• Road expansion, national car, and fragmented development of new towns in peripheral areas contribute to the emergence of car culture and automobile society in Kuala Lumpur<br>• Socio-cultural values of car culture overrule the spatial potential for walking<br>• Mixed method can be used to understand the socio-spatial dynamics connected to path dependencies of transport and land use policies |
| Section 4: Mobility inequality at the neighbourhood scale | Mobility inequality in Menteng, Jakarta by juxtaposing potential and realised accessibility (Chapter 5) | Mixed method combining:<br>• Space syntax<br>• Visual analysis of video recordings<br>• Analysis of on-street surveys | • Spatial configuration, land use, and user's perception affect the potential and realised accessibility.<br>• Distribution of education facilities in the case study is likely to follow the logic of vehicular instead of pedestrian movement<br>• Negative perception of walking negates the potential of pedestrian accessibility<br>• Women and those who walk are likely to report negative mobility experiences<br>• Multiple data sources (mapping, interviews, videos) provides triangulation and comprehensive insights regarding realised accessibility |
| | Mobility inequality in four selected neighbourhoods each in Jakarta and Kuala Lumpur, manifested as gendered mobility and perceptions of safety (Chapter 6) | Mixed method combining:<br>• Analysis of on-street surveys<br>• Visual analysis of video recordings<br>• Space syntax | • Gender differences influence transport and mobility choices in Jakarta and Kuala Lumpur.<br>• Perception of safety is spatially and socio-culturally constructed.<br>• Women are more likely to report negative perceptions of safety as compared to men.<br>• Spatial configurations in Jakarta and Kuala Lumpur result in different perceptions of safety.<br>• Multidisciplinary perspectives and mixed method approaches are required to understand gendered mobility. |

adoption of capability (Beyazit, 2011; Sen, 1990; 2000) and social justice principles (Beyazit, 2011; Harvey, 1973; Martens et al., 2012; Rawls, 1971), whereby differences in mobility could be attributed to differences in the ability and capacity to utilise potential accessibility given by the system. Understanding how low-income groups and women negotiate their fear while walking on the street can be used in defining the minimum threshold of mobility (in reference to minimum threshold of accessibility, see Martens, 2012; 2017).

Combining technical-functional analysis and in-depth reasoning to understand mobility inequality, this dissertation demonstrates how the two perspectives of mobility studies could complement each other in capturing the intrinsic (i.e. individual attributes), extrinsic (i.e. socio-spatial contexts), and the interplay of both factors. The technical-functional approach can be used to define and measure differences in mobility (e.g. travel time, distance, mode, option, pattern) and accessibility (e.g. easiness and cumulative opportunities to reach key functions), while the in-depth narrative can unfold the underlying reason for differences in mobility and accessibility. Although this dissertation was not the first attempt to incorporate the two major strands of mobility studies, it differs from previous research (for instance Kwan, 1999; Schwanen et al., 2008) in terms of methods applied and contexts. Through applying the normative analysis of space syntax in combination with visual analysis, analysis on individual qualitative data from in-depth interviews and on-street surveys, literature review, and statistics, this dissertation contributes to theoretical debate of mobility inequality at both systemic and individual levels.

Incorporating both strands of mobility studies, findings from this dissertation resonate with interchangeably discussed concepts, such as transport-related social exclusion (Church et al., 2000; Kenyon et al., 2004) and transport inequality (Banister, 2018), highlighting that women and captive pedestrians are excluded in most discussions even as they experienced more negative attachments when travelling. The findings also contribute to the current understanding of gendered mobility and gender-transport relation (Hanson, 2010; Law, 1999) by highlighting that socio-spatial contexts can amplify gender socialisation that produces gendered mobility. Importantly, discussion on the emergence of mobility inequality as a systemic outcome of planning policies over time, which is reflected in and form the urban spatial configuration (see Section 3), has presented an example of how an unjust mobility system and regime is created and sustained, resonating with the discussion on mobility justice (Sheller, 2018).



### *8.2.2. Combining spatial and social theories for understanding mobility*

The use of spatial configurational analysis linked with the understanding of the local socio-cultural contexts that produce mobility experiences provides an additional layer for understanding transport and land use integration (Bertolini, 2017) using a people-centred approach (Geurs and van Wee, 2004; Miller 2005; 2007; Preston and Rajé, 2007). Spatial tendencies to avoid or move through certain streets influence the perceptions of safety as part of experiencing the space. As evident in Section 4, in terms of walking, pedestrians feel safer when there are a number of fellow pedestrians using the same street. From the spatial configurational analysis perspective, this type of street with a large number of pedestrians is well-connected to other streets. In contrast, feeling unsafe is intensified in desolated streets, which have less connection to other streets, such as dead-ends. The heightened safety concern presents more in female pedestrians. This corroborates Nguyen and van Nes (2013) study on how women are less likely to be found in desolated streets and Rokem and Vaughan (2018) on how spatial configuration plays a role in urban segregation and limiting the mobility of certain ethnic groups. This dissertation adds to this discussion by highlighting the role of spatial configuration in producing the marginalisation of pedestrians and gendered mobility.

### *8.2.3. Theory validation*

This dissertation presents new empirical evidence using cases of mobility inequalities from Jakarta and Kuala Lumpur as typical representation of Southeast Asian metropolitan cities. The findings revealed socio-spatial contexts pertaining to mobility inequalities beyond the current understanding of the developed economic regions. Cases and findings from Jakarta and Kuala Lumpur provide theory testing, confirmation, and validation of whether the current knowledge of mobility is applicable in developing economic regions. In comparison to the developed economies context, the gap between those with and those without access to private motorised vehicles in Southeast Asia is prominent since public transport is deemed (and is often practically) unreliable (see Section 3). Attitudes to and perceptions of walking and the spatial configuration regarding pedestrian networks also differ in the developing economies context. For instance, while European cities mostly retain their historical, pedestrian friendly core, the historical core in Jakarta and Kuala Lumpur is overruled by newer developments focused on highways (see Section 3). This presented a peculiar challenge for addressing mobility inequality. One takeaway lesson is that copying transport planning strategies from

the developed economic regions will not work and could even widen the current gap of mobility inequality, unless a careful and thorough consideration of the local socio-cultural context takes place.

## 8.3. Contributions to methodology

Combining qualitative and quantitative methods, this dissertation contributes to providing a novel combination of methods for a contextualised understanding of mobility inequality that is sensitive to local socio-cultural conditions but at the same time can be applicable across scales with the consideration of limited data availability (i.e. utilising open source data, see Dembski et al., 2020). The mixed method to understand mobility inequality consists of (1) spatial analysis using space syntax, (2) visual analysis of video recordings, (3) text data analysis of literature, in-depth interviews (transcripts), and on-street surveys (transcripts), and (4) statistical analysis of on-street surveys. This mixed method combines the strengths and reduces the limitations of each method if they were performed separately; hence it complements and triangulates analysis from each method. In practice, this mixed method considers limited data availability and financial constraints when conducting research in fast-growing metropolitan cities in Southeast Asia. In addition, the mixed method can encourage an interdisciplinary discussion that is required for understanding the multi-sectoral nature of mobility inequality issues. Transport studies, for instance, rely heavily on technical measurements while social studies on mobility are often presented in an abstract and narrative style.

### *8.3.1. Advantages of the methods*

The use of this mixed method approach provides the following advantages:

- The use of space syntax as a normative and adaptive measure that can work across scales and integrate both pedestrian and vehicular movements (Al-Sayed et al., 2014; Hillier, 2012; van Nes and Yamu, 2018; Yamu and van Nes, 2017). In addition, space syntax analysis requires data on street network configuration, which are often easily available to be drawn or modelled, in comparison to traffic modelling that requires additional detailed information such as street width, capacity, and traffic volume. This allows the method to be easily replicable in a context of limited data availability, and utilise easily available open source data, which will be beneficial for practitioners and researchers in regions of developing economies. Those who are interested could conceivably follow a short, low cost training to be able to conduct the same research. In sum, space syntax offers a simple yet robust measure on potential accessibility that integrates both behavioural and social aspects of mobility.

- Visual analysis of video recordings allows observation of mobility conditions for certain periods of time, which can be repeated and analysed in a controlled environment. This is useful in informal settlements and areas where researchers are not as free to conduct ethnographic observations in situ. Using the walking with video approach (Pink, 2007), video recordings can capture sensorial experiences, such as sounds, movements, and the portrayal of current situation and the immediate environment as it is (Heath, 2011; Pink, 2007). This method of visual analysis provides benefits for understanding the socio-spatial contexts influencing mobility compared to installing a static camera or traditional on-street registrations.

- The use of on-street surveys provides in situ advantages by avoiding self-reporting bias in data compared to a conventional survey that relies on memory recall. This method is also suitable for a context where data literacy is low, such as in low-income settlements in Southeast Asian cities and other regions of the world. In terms of resources and capacity, the on-street surveys are considerate of the time availability of the respondents and researcher, enabling data collection in a short period of time and is less costly compared to a conventional door-to-door survey.

- In-depth interviews provide verification of the spatial and visual analysis that were conducted before. This method is ideal for gaining the perception of the respondents and gaining insight into their travel behaviour. This helps in understanding the local nuances related to the spatial and socio-cultural contexts influencing mobility inequalities.

### *8.3.2. Limitations*

The limitations of the mixed method approach are mainly attributed to the practical considerations, such as:

- The data collection is (as yet) unable to obtain detailed biometric data regarding mobility experiences, such as sweat, blood pressure, and heart rate while walking or driving, because they require a complex data collection protocol that cannot be performed given the time and resource limitations of the research project and the expected willingness of respondents in the Southeast Asian context.

- Ethnographic observation requires careful consideration of the privacy of the respondents. In this dissertation, care was taken while recoding the video and in the processing of the recordings data to not link the findings to specific individuals and/or anonymising traceable personal information. In contexts where privacy is highly regulated, this approach might require further additional protocol, such as the employment of face blurring software.

- The size of the sample set for on-street surveys and in-depth interviews is constrained due to time and availability of respondents. This is of course limited since the researcher is conducting the bulk of data collection alone during fieldwork.

- The findings should be interpreted with an understanding of the local contexts. The ability to speak the local language and understand the local culture has been invaluable for this dissertation (e.g. seeking permissions from the head of the neighbourhood). Future research will need to pay attention to this during data collection.

- In choosing case comparison for hypothesis testing or exploratory research as in this dissertation, attention must be paid to the similarity and comparability of the cultures of the cities investigated. For instance, Jakarta and Kuala Lumpur are located relatively close to each other and have similar cultures compared to other Southeast Asian cities. However, for cross-case comparison robustness, a variety of cities with differing cultures and contexts can be used.

In sum, using a mixed method that can be easily replicated and applied in terms of data collection (e.g. utilising open source data) and resources (e.g. at less cost), this dissertation intends to provide a research method and a framework that can be operationalised in other Southeast Asian cities such as Bangkok (Thailand), Manila (Philippine), or Ho Chi Minh (Viet Nam) given the socio-spatial challenges that are peculiar to this region (see Table 1.5) with an understanding that each city carries its own unique nuances. In general, this dissertation demonstrates a novel combination of methods for understanding mobility inequality, highlighting the influence of spatial configuration and socio-cultural constructs. In this regard, this dissertation opens up the possibility of combining spatial configurational analysis with geographic location-based analysis using geographic information system (GIS) to produce spatial knowledge (Pfeffer et al., 2013) to contribute to policy insights. Section 4, Chapter 5, tested this possibility by correlating the configurational analysis results (using space syntax) with geocoded locations of educational facilities (using GIS) to determine whether the distribution of schools followed vehicular or pedestrian logic. Chapter 6 in Section 4 also correlated the analysis of walkability potentials using space syntax and the geocoded perceptions of safety from on-street surveys using GIS.

The visualisation of spatial analysis does in fact facilitate communication with stakeholders, as experienced by the researcher during the in-depth interviews when respondents were asked about their opinion regarding the spatial analysis results. This experience can be brought into practice by using visualisation of spatial analysis to factually inform policy makers during the planning process (Martínez et al., 2016; Pfeffer et al., 2011; 2013; 2015).

## 8.4. Future research directions

This dissertation explores and investigates socio-spatial contexts influencing mobility inequalities, which are manifested in the form of marginalisation of pedestrians in Jakarta and Kuala Lumpur across scales (i.e. metropolitan and neighbourhood scale). Future research could look into:

- More case studies to improve external validity and test the replicability of the mixed method approach. Future studies can be conducted in other Southeast Asian metropolitan cities that are also challenged with a wide socio-economic inequality, such as Bangkok (Thailand), Manila (Philippines), or Ho Chi Minh City (Viet Nam). Interpretation of the results, however, should always be linked to the understanding of local socio-cultural values. It will be particularly interesting to see whether peri-urbanisation in other Southeast Asian cities (Woltjer, 2014) generate similar patterns of vehicular and pedestrian movements. Understanding mobility inequality in other Southeast Asian cities is in line with the rising consideration

of sustainable transport principles in the region (ASEAN, 2019a). On this note, it will be useful to assess the impacts of the new enacted policies of sustainable transport (for reference on policy assessment, see Arts et al., 2016; Chaktoura and Pojani, 2016; Le Clerqc and Bertolini, 2003) and trace whether these policies are reflected in the spatial structure.

- Incorporating other aspects of mobility inequality, such as biometric conditions related to mobility experiences (e.g. sweat, heart rate, and blood pressure), the design of the built environment (e.g. lighting, enclosure, and thermal comfort), or the influences of race and religion on mobility. The investigations would require another set of methods to be combined with the mixed method approach applied in this dissertation. For reference, the analysis of biometric measurements related to mobility can be conducted following Zhou et al. (2014), the assessment of built environment design influencing mobility can employ a visibility analysis related to safety (Takizawa et al., 2010; Turner et al., 2001; van Nes and Yamu, 2020), and the investigations into racial and religion-based mobility restrictions can refer to Sheller (2015; 2018). In the wake of the Covid-19 global pandemic, it would also be interesting to investigate the resulting differences in mobility caused by travel restrictions and health safety risk in public transport.

- Further development of socio-spatial analysis. This dissertation adopted the spatial configurational analysis from the urban morphology and network tradition to incorporate behavioural and social aspects of how people navigate within an urban system. This analysis focuses on street network configuration and therefore might overlook other multi-dimensional factors, such as building height, street width, or traffic condition (Ratti, 2004) or environmental conditions such as climate (Saneinejad et al., 2012; Shaaban et al., 2018). Integration of these factors in GIS analysis can produce a richer spatial knowledge via multicriteria analysis (Pfeffer et al., 2013). There are also opportunities to integrate the socio-spatial analysis with a volunteered geographic information (VGI) and the use of social media (soft GIS) (Kahila-Tani et al., 2016; Poplin et al., 2017). The social analysis part can be strengthened by performing walking with video approach (Pink, 2007) covering different types of neighbourhoods and longer time periods. It should be noted that these developments should consider data safety and privacy in relation to the use of open source data.



- Scenario development and simulation testing for addressing mobility inequality. Findings from this dissertation can be used as an input to model development impacts across scales as a planning support system (Batty, 2007; Goodchild, 1991; Maguire et al., 2005). For instance, the findings can be utilised to model how the extension of Jakarta mass rapid transit (MRT) to the western part of the agglomeration area (i.e. South Tangerang) impacts on walkability in the neighbourhoods within two kilometres along the MRT route and mobility behaviour of the inhabitants of those neighbourhoods. In this case, space syntax can be used as a starting point as this method has enjoyed numerous applications in planning and design projects (Hillier et al., 2007; Rose and Stonor, 2009; van Nes and Yamu, 2018; 2020). The use of these analyses can facilitate a collaborative planning approach (Healey, 2003; Pfeffer et al., 2013) and provide a platform for the participation of the marginalised groups in the planning process.

## 8.5. Contributions to transport mobility practices

The understanding of the interplay between socio-spatial contexts and individual attributes producing mobility inequalities contributes to transport planning practices through:

- Highlighting the long term and almost irreversible impacts of transport and land use policies. Section 3 shows that car-oriented transport policies are difficult to reverse and have a huge adverse impact on social and spatial networks. During the in-depth interviews, the respondents came to the conclusion that road expansions and fragmented peri-urbanisation developments can be clearly seen in the street network models. These developments have set up an institutional routine for urban and transport planners, as well as for decision makers, to prioritise vehicular traffic as a symbol of a modernised and developed city leading to mounting transaction costs for a sustainable mobility development (Miharja and Woltjer, 2010). For Jakarta, this transport planning practice is part of demonstrating national sovereignty after independence, while for Kuala Lumpur, this is part of achieving the 'world class city' vision (see Section 3). In society, this value is translated into stereotypes that glorify the use of cars and motorcycles in contrast to walking as a low-income transport mode (Chin, 2013; Urry, 2004; Williamson, 2003). Changing or reversing this social value is difficult and can take a long time.

- Providing insights to define and implement sustainable key performance indicators (KPI) for addressing mobility inequality. In an in-depth interview with an employee from the Department of Transportation in Jakarta (6 December 2018), the interviewee remarked that as a government employee, they are bound to their job description and pre-defined KPIs. A project can be difficult to implement if it contradicts the existing KPIs. In this case, the mixed method employed in this dissertation can provide a measurable indicator of mobility experiences, which can be easily performed and adopted into KPIs. For example, regulating transit stops (bus stops, MRTs) to be within a walkable network distance (i.e. 400m as in Singapore or 500m in Indonesia) and also ensuring barrier-free access. This can help decision makers, planners, and staff that are often fully informed about sustainability, sustainable transport, and sustainable mobility (Pojani, 2020) but lack capacity to operationalise those concepts into workable actions beyond political tokenism.

- Providing a toolbox for defining, measuring and understanding mobility inequality within a certain context. Sections 3 and 4 demonstrate the use of a mixed method combining space syntax, video recordings, on-street surveys, and interviews, that can be easily conducted in a short time and at low cost. This method encourages the use of people-based measurements to complement conventional place-based measurements widely used in practice such as time-based or zoning accessibility measures (Geurs and van Wee, 2004). Additionally, workshops and focus groups can be performed to give voice for the marginalised who are neglected in current policy and planning practices (Banister, 2018; Lucas, 2012). During these workshops or focus groups with a mixed respondent group of policymakers and general public, cases of mobility inequalities can be presented in videos and visualised through spatial analysis. The use of spatial-based media to inform actors in a participatory planning process has proven quite effective in raising spatial awareness and spatial knowledge production (see Pfeffer et al., 2013); however, it should be noted that the understanding of local contexts should be highlighted in discussing social issues such as inequality. For example, it is often in the Indonesian context that respondents choose not to walk because of the social stigma (poverty) whereas walking is highly encouraged in Western European contexts and carries no such stigma.



- Highlighting the importance of combining top-down and bottom-up approaches for addressing mobility inequality in line with sustainable development (i.e. equity) principles. The on-street surveys employed in this dissertation represent the bottom-up approach as it captures mobility experiences of the marginalised to complement the top-down approach. Integrating this bottom-up approach in transport planning practices helps to ensure that policies at the metropolitan scale (often defined as top-down process) are not in conflict with daily mobility practices at the neighbourhood scale, especially concerning the marginalised. Public acceptance is key in implementation of policy and especially so in pushing for a democratic city (i.e. Indonesia being the largest democracy in the world), hence this combination is crucial (Silva, 2013).

In sum, the mixed method employed in this dissertation fully utilises the expertise in space syntax analysis with ethnographic observations to collect data and offer innovative insights into the urban mobility conditions in Southeast Asian contexts. With these findings, policymakers are able to create cross-scale strategic plans to improve potential and realised accessibility beyond a car-based future as many Southeast Asian cities are spiralling into. Currently, mobility inequality has been deeply ingrained in transport mobility practices, leading to normalised perceptions of seeing travel difficulties experienced by the socially marginalised groups as a normal daily life occurrence. The first step in addressing such blindness and insensitivity is to acknowledge the emergence and manifestation of mobility inequalities. Providing visual and factual evidences can affect changes in institutional settings such as facilitating cross-agency collaborations across scales. Clear KPIs can provide institutional and legal strength to enforce the policy goals. Shifting policy priority from the private-motorised based development to public transport and walking can improve institutional and financial capacity to reduce mobility inequality (see Section 5) and help in breaking the rigid and business-as-usual organisational routine. These enable further improvement to policies in light of sustainability and equity goals (United Nations, 2020b).

## 8.6. Personal note: Researcher's experience regarding mobility inequality

Cases of mobility inequalities in the form of the marginalisation of pedestrians and the neglect of the mobility needs of the marginalised in Jakarta and Kuala Lumpur, as investigated in this dissertation, have presented us with a new perspective in performing our daily mobility.

Be it walking, using public transport, riding a motorcycle, driving a car, or a combination of these modes, our choice of transport mode and how we use it in our daily mobility reflects differences in our ability and capacity to move. These differences are influenced by our individual attributes, the local socio-cultural beliefs, and our interaction with the urban spatial configuration. Difficulties such as feeling unsafe while traveling alone in unfamiliar places, at certain times, or using certain modes, or difficulties due to our inability to use the available infrastructures are part of differences in mobility. Being a woman in Jakarta or Kuala Lumpur, it is a challenge to travel alone at night regardless of the modes being used, especially in an unfamiliar setting. Although there is no socio-cultural restriction on travelling alone, women are seen as 'easy prey' when it comes to street crime and sexual harassment in public spaces. There should be an effort or movement to address these concerns, no matter how small, as they affect an individual's mobility and accessibility to key functions (e.g. to go to school, to work, to get medical treatment, to get groceries).

As an urban planner who was born, trained, and having worked in Indonesia, it gives the researcher first-hand observation and experience that the current planning system does not consider the mobility needs of the marginalised. It is often the case to put a bus stop next to a settlement just for the sake of fulfilling accessibility requirements within a certain walking distance. Considerations on how people will actually use public transport are rarely taken into account (Tan, 2018). Incorporating such considerations requires institutional change. There were also countless first-hand experiences of how inflexible the bureaucracy is regarding the adoption of innovations for sustainable mobility. Any new or better approaches are hard to implement if it goes against the pre-defined institution's key performance indicators due to perceived high transaction costs (Miharja and Woltjer, 2010). In the end, it will be business-as-usual even though there have been numerous workshops and training sessions about sustainability, especially regarding people-centred approaches to mobility and accessibility. The knowledge remains as a discourse and is rarely implemented into practice. At best, the knowledge is written in the policy paper as a specific goal, but its implementation is another story as it is rarely evaluated (evaluation is mostly administrative and finance-related) or accounted for. It is the intention of this dissertation to shed light on the current planning practices that could inadvertently widen the mobility inequality gap, unless serious consideration of the mobility needs of the socially marginalised groups are brought in place. As planners and policy makers play a significant role in creating and managing the transport mobility system, it is part of their responsibility to undo the entrenched institutional biases and reduce the inequality gap in mobility through changing organisational routines and start actually implementing the people-centred approaches in transport mobility planning.

The main motivation for writing this dissertation comes from the researcher's experience working in planning practice and as a female traveller – walking, driving, and using public transport in Jakarta and Kuala Lumpur. These experiences translate into an unrelenting question about how those differences relate to spatial planning or could be resolved by spatial planners. In this regard, spatial configurations were found to be more intuitive compared to other spatial aspects as people have tendencies to walk through certain streets. These tendencies are quite fascinating when walking through the labyrinthian alley of informal settlements in Jakarta or following fellow pedestrians using shortcuts in Kuala Lumpur. These experiences have enriched this dissertation, contributing to the realisation that mobility inequalities are individually differentiated, but at the same time, it is also influenced by formal and informal institutions manifesting as the socio-spatial context. This is how this dissertation comes to highlight the socio-spatial approach for understanding mobility inequality.

The selection of socio-spatial approaches is not without a challenge. As a scholar, the main challenge is to bring the topic into discussion across three fields of study: transport planning, social sciences, and network theory of space syntax. Each of these fields have their own tradition and language. Without any intention to confront these three disciplines, there were different treatments when presenting papers on mobility inequality. Transport studies will say that they prefer transport instead of mobility as a term and so does the space syntax discipline. Social sciences will say that the analysis is too technical or too superficial. A takeaway lesson here is that more efforts are required to connect these rigid and abstract discipline boundaries.

Finally, by reading this dissertation, I hope to provide readers with a new perspective regarding urban mobility in Jakarta and Kuala Lumpur. When readers have the opportunity to walk, drive, or take public transport in these cities, they should try to spot the hidden mobility inequalities, such as women who have to walk cautiously on their way to work because the only motorcycle in the household is used by the husband, or rural in-migrant workers who walk as their only option, or wheelchair users traversing the busy rush-hour on Jakarta commuter line, or women who have to wait cautiously for the ridesourcing services to arrive at a deserted MRT station during off-peak hours in Kuala Lumpur, or the elderly who are highly dependent on other family members or neighbours for getting around the neighbourhood. Furthermore, if the readers are given the opportunity to work in the planning systems